

8. Sand Deposition and Point Bar Formation inside River Channel Bends

Expectation:	Formation of point bars on the inside bends of river channel meanders.
Author:	Pat Davis, South Florida Water Management District. Don Frei, South Florida Water Management District.
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Relevant Endpoints:	Ecological Integrity/Restoration/Physical Integrity - river channel substrate characteristics Ecological Integrity/Restoration/Physical Integrity - hydrogeomorphic processes
Baseline Conditions:	Point bars are not present in remnant river channels. Point bars that were present in the pre-channelized system have been colonized by vegetation and elimination of flow has precluded development of new bars. A remnant sloping riverbed still remains along inner portions of meanders, but is covered with organic depositions and /or has extensive aquatic vegetation.
Reference Conditions:	<p>The historic geomorphology of the Kissimmee River featured sandy substrates, meandering channels and point bar formations (Warne, 1998). Based on Rosgen's river morphology classification system (Rosgen, 1994,1996), the Kissimmee River is a C5 stream, which is characterized as relatively sinuous, with low-gradient slope, meandering channels, point bars, and well developed flood-plains in broad drainage basins. Some portions of the Kissimmee River have characteristics of a DA5 stream system, which is a low gradient, anastomosing (multiple channel) system, with high channel width to depth ratio and sandy substrates (Warne, 1998).</p> <p>Aerial photographs during extreme low water levels (38.64 NGVD at Ft. Kissimmee) in June 1956 show extensive sand bar formation along the river. Point bars occurred on the inside of 329 of 330 river meanders with an arc angle $> 70^{\circ}$. Largest point bars occurred on curves downstream of long straight river runs.</p> <p>Point bars formed on inside curves of meanders after flow was partially restored to remnant river channels in Pool B (Toth, 1991). After the Test Fill Plug was constructed in 1994, point bars in the adjacent remnant river channel increased in area and height, particularly after high flows in winter 1998. Sand deposition was observed primarily after bankfull discharge events.</p>
Mechanism for Achieving Expectation:	Reestablished flow is expected to form point bars on inside curves of meanders in remnant river channels. Restoration of point bars will be dependent on discharge from the Upper Basin and duration of flow. Relationships between river sediment size, expected velocities, and sediment deposition and transport (Leopold, 1994) indicate that bankfull discharges of $40\text{m}^3/\text{sec}$ to $57\text{m}^3/\text{sec}$ are needed for point bar formation in restored river channels.
Adjustments for External Constraints:	None.

Means of Evaluation:

The primary parameter that will be used to evaluate restoration success will be sand deposition on inside curves of meanders and immediately downstream of these curves. Point bar formation will be tracked and georeferenced with GPS along 80 meanders with an arc angle $> 70^{\circ}$ within Pool C and lower Pool B. This area will be affected by restored flow from the first phase of the restoration project. The surface area, length, and width of sandbars also will be measured. Core sampling of the river channel bottom will complement visual observations by documenting the type and depth of river bottom.

Time Course:

Based on sediment transport and deposition in Pool B during the Demonstration Project of 1985-88 and after the Test Fill Plug construction in 1994 point bar formation will occur following bankfull discharge events. Reestablishment of pre-channelization point bar distribution will occur within 3-5 years, depending on the magnitude and duration of bankfull discharge.

References

- Leopold, L. B. 1994. *View of the River*. Harvard University Press, Cambridge, MA.
- Rosgen, D.L. 1994. A classification of natural rivers. *Catena* 22: 169-99.
- Rosgen, D.L. 1996. Applied river morphology. *Wildland Hydrology*, Pagosa Springs, CO.
- Toth, L.A. 1991. Environmental responses to the Kissimmee River restoration project. South Florida Water Management District. Technical Publication 91-02.
- Warne, A.G. 1998. Final Report: preliminary geomorphic assessment of Kissimmee River system, Florida. Prepared for South Florida Water Management District, U.S. Army Corps of Engineers, Waterways Experimental Station, Vicksburg, MS.